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(12) UK Patent Application (19) GB (11) 2 296 393 (13) A

(43) Date of A Publication 26.06.1996

(21) Application No 9526490.9

(22) Date of Filing 22.12.1995

(30) Priority Data
(31) 9426197 (32) 23.12.1994 (33) GB

(51) INT CL^6
H02G 15/10 15/013

(52) UK CL (Edition O)
H2E EFCK EFCQ EGGE

(56) Documents Cited
EP 0206854 A1 US 5266741 A US 4831215 A

(58) Field of Search
UK CL (Edition O) H2E EFCK EFCQ
INT CL^6 H02G

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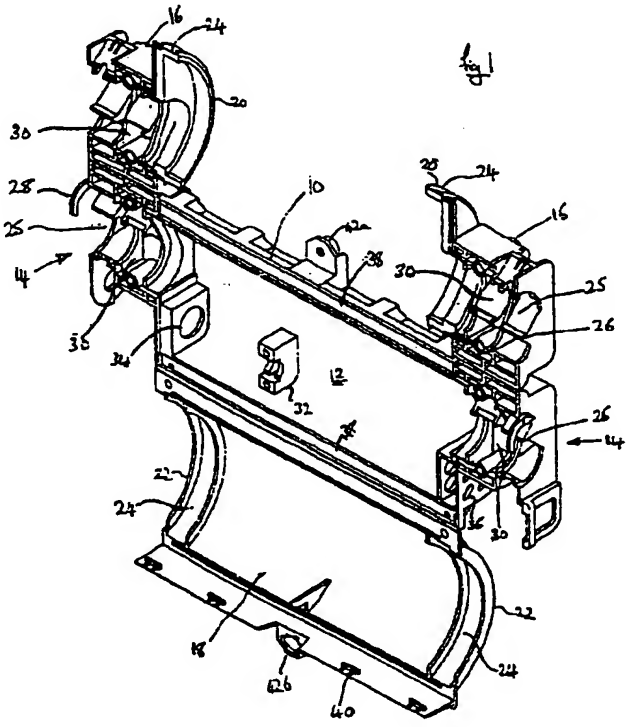
(54) Cable splice closure box and cable clamp

(57) A cable splice closure box comprises a body 10, transversely-spaced cable sealing doors 16 and a central door 18 for sealing the region between the cable sealing doors and allowing access to the splices. Each door 16 and the adjacent body 10, when brought together (figure 5, not shown) form a cable clamp having diagonal cams (108, 106). A pair of clamp elements (112, 114) are simultaneously screw-driven down respective cams to clamp a cable against abutments (104). Driving the cams can also cause the door and adjacent body to be drawn together.



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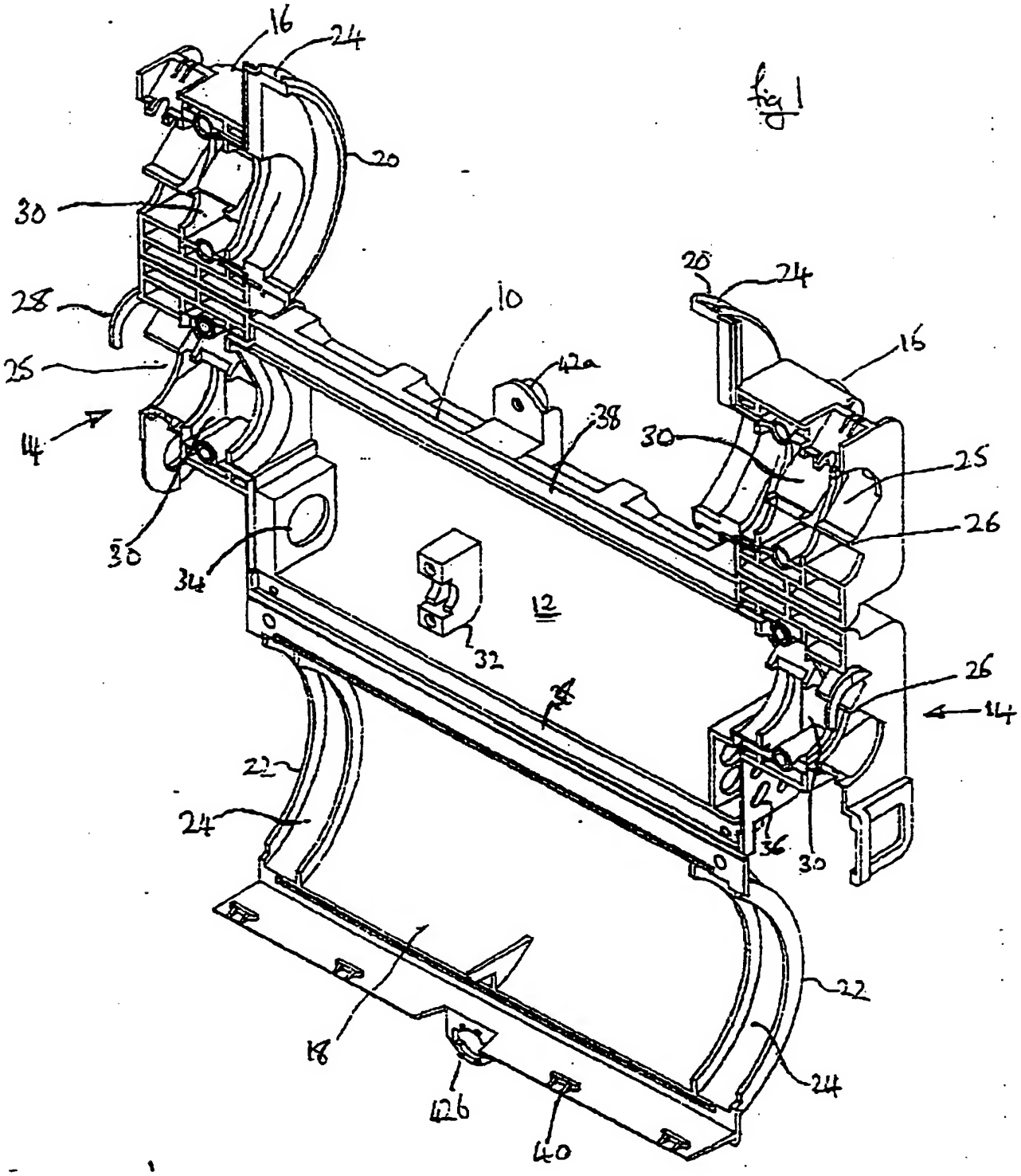
16
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42a
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42b
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fig 1

fig 2

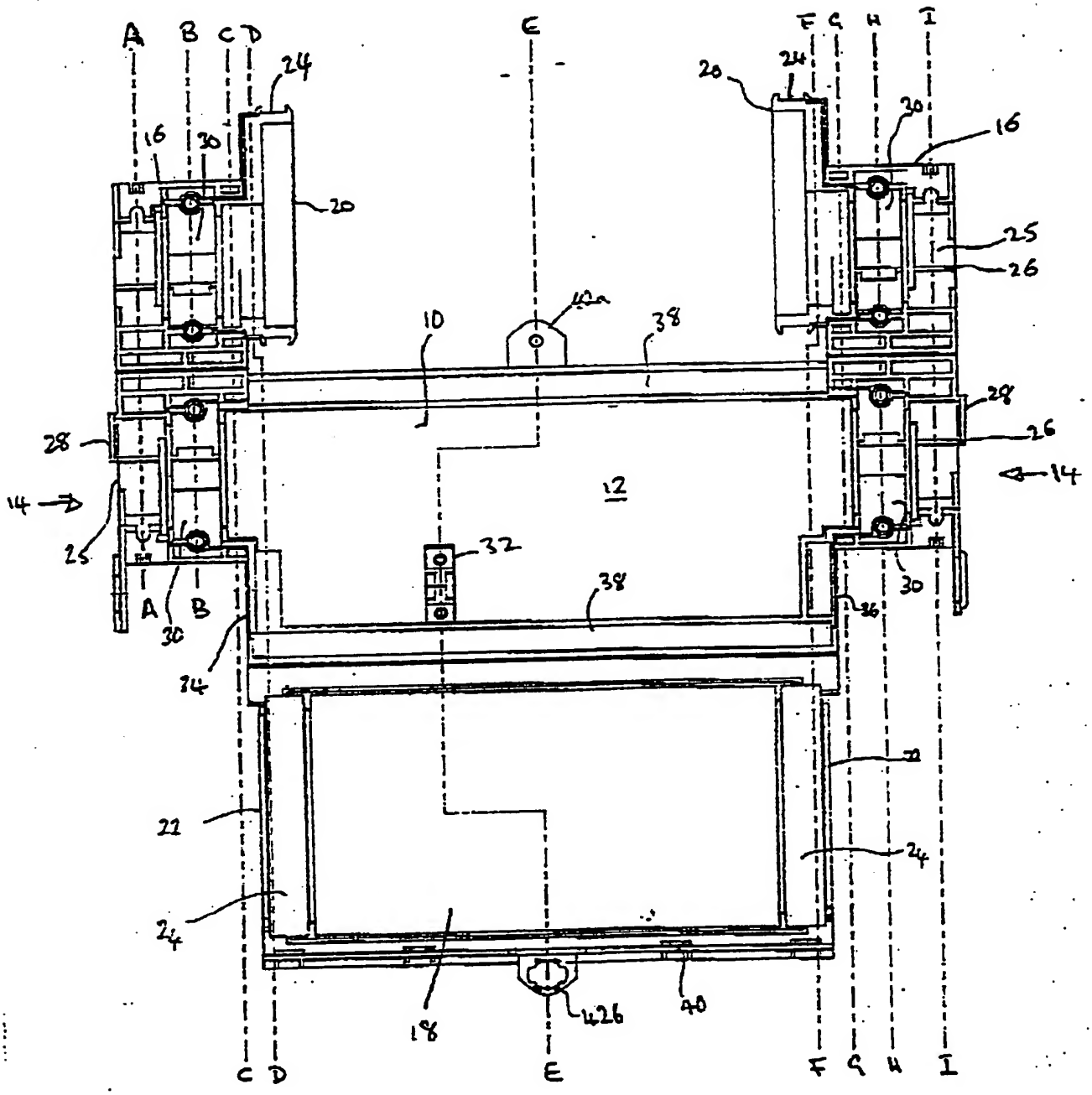


fig 3a

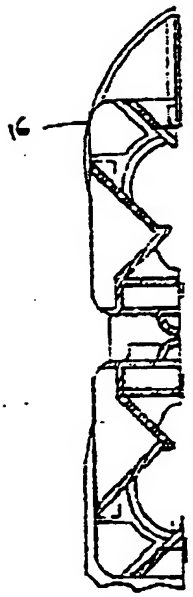


fig 3b

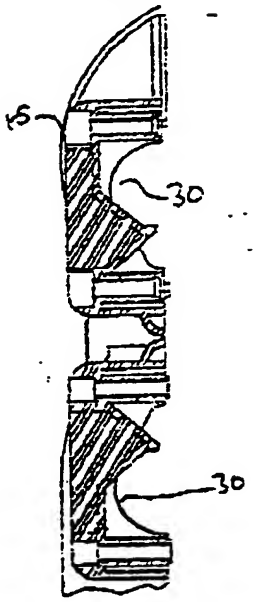


fig 3c

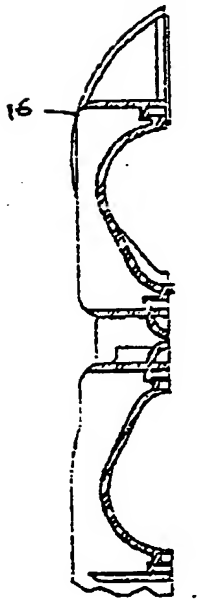
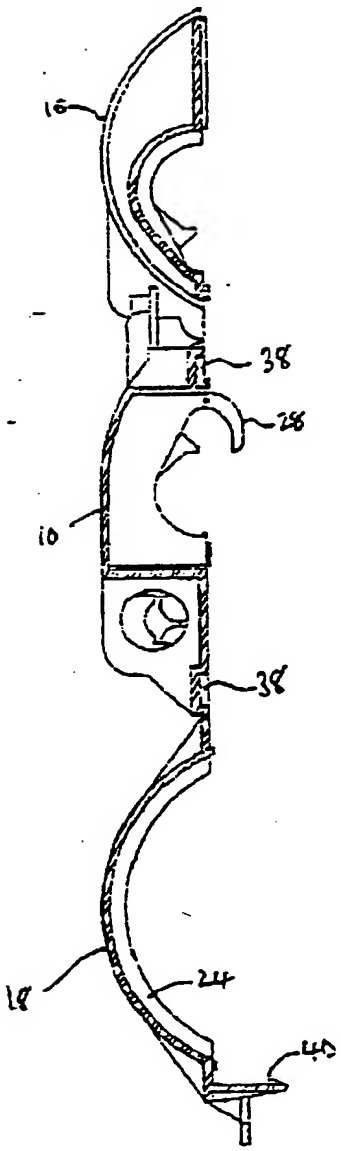
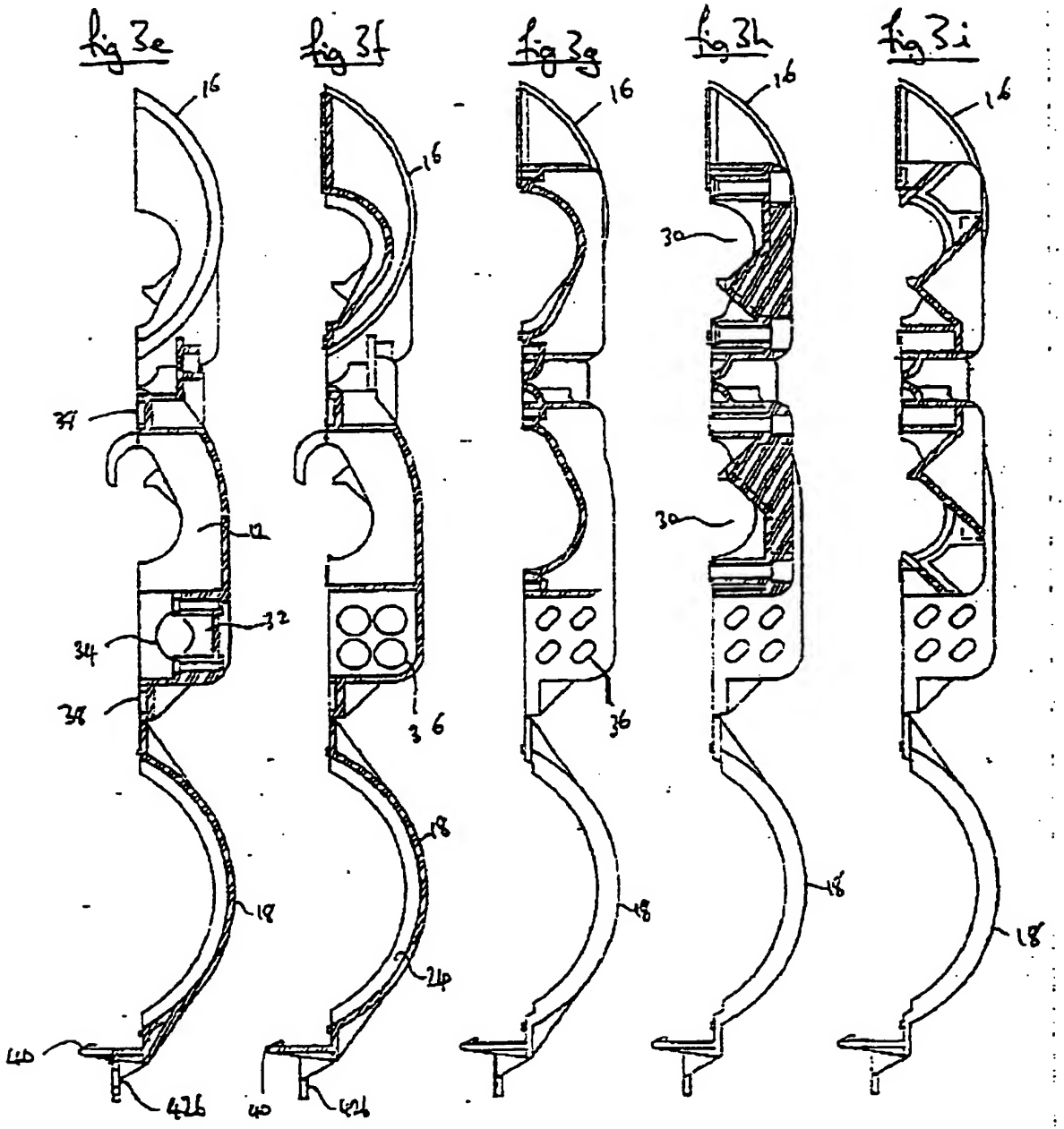


fig 3d





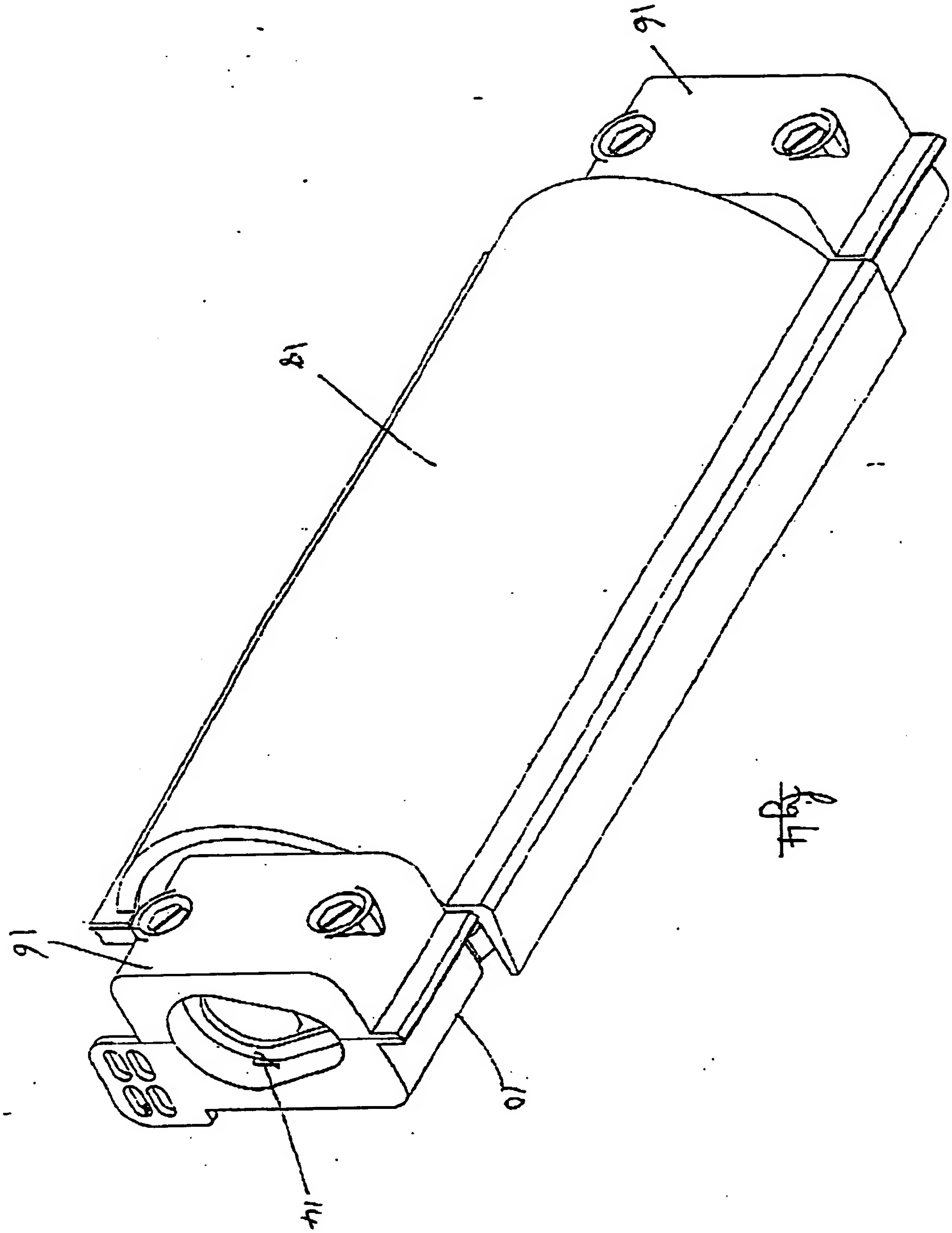


Fig. 4

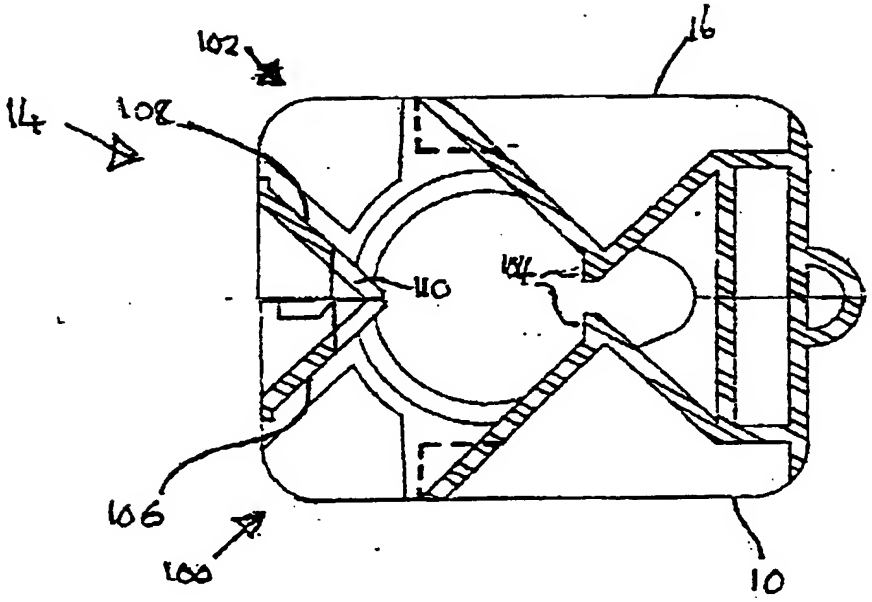
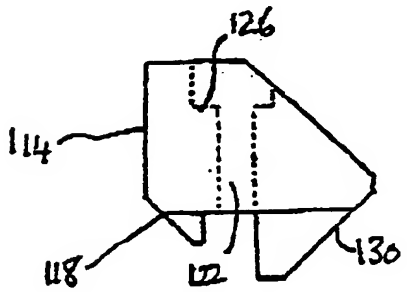
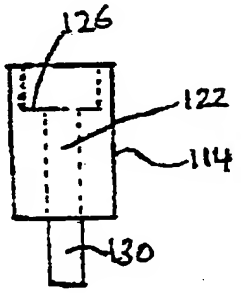
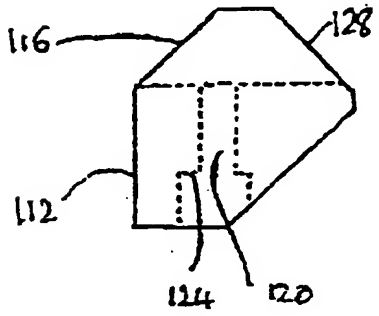


fig 5







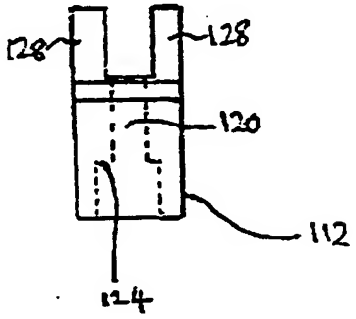


fig 6

fig 7

CLOSURE APPARATUS

The present invention relates to a closure apparatus, particularly for use in telecommunications systems.

It is known to provide junction boxes along the length of a suspended telephone cable, by attaching the box to or around the cable, and splicing drop-wires to the message-carrying wires of the cable within the box. The drop-wires then exit from the box through a different opening. Such junction boxes are referred to as "aerial closures", and the present invention seeks to improve on previously known designs.

If such a closure is fitted after erection of the relevant cable, then clearly the operator will be working at some height, and a compact, one-piece closure is desirable. It should also be simple to operate, and robust.

A difficulty often encountered with closure apparatus is that of sealing the internal parts from the environment.

This is particularly the case with aerial closures since water will collect on the cable, and will run therealong into an inadequately sealed closure. This might contaminate or cause corrosion of internal connections, with undesirable results.

The present invention therefore provides in its first aspect a closure apparatus for a cable connection, comprising a base portion and a plurality of doors, including a pair of transversely spaced sealing doors each incorporating a sealing member, thereby to enable sealing of a cable between the sealing door and the base portion, and a central door disposed between the sealing doors and adapted to seal the region between the sealing doors.

Thus, the closure can be installed in place over a wire, with the sealing doors clamping the closure onto the cable and providing a main cable seal. Whenever desired, the central door can be opened to gain access to the connection within the closure, and that opening of the central door need not result in the main cable seal being broken, nor will it necessitate removing the closure means from the wire. Thus, an operator can gain quick and easy access to the connection within the closure means, and need not worry about re-making the main cable seal each time.

Clearly it is preferable if the central door has a sealing member around its perimeter, to provide a sufficient seal when the closure is completely closed. This can be made easier if the central door overlaps the sealing doors, in that a single seal around the central

door is then sufficient to provide sealing for all doors. Also, the closing of the central door then provides a further safeguard against accidental opening of the sealing doors.

In a preferred arrangement of the invention, the sealing doors share the same hinge axis, which axis is spaced from the hinge axis of the central door. Thus, the respective doors close in opposite senses, providing further security.

A suitable form for the main cable seal is an elastic gel. A block of gel can be provided in each of the base portion and the sealing doors, in corresponding positions, such that closing the sealing door onto the cable causes the gel to conform to the outer shape of the cable and seal therewith. Such gels are well known to those skilled in the art, and may be as disclosed in US 4942270. Alternatively a mastic layer could be employed.

In its second, independent, aspect the present invention provides a cable clamp, suitable for use in the closure apparatus of the first aspect, but not limited to that use.

Thus, the second aspect of the present invention provides a cable clamp comprising a circumferential ring member including on its internal surface an abutment surface and at least one cam surface, and at least one clamping element having an abutment surface and a cam surface;

the clamp being adapted such that when the cam surface

of the clamping element is in contact with the cam surface of the ring member, motion of the clamping element causes the abutment surface of the clamping element to approach the abutment surface of the ring member.

Preferably, however, there are two such clamping elements and two such cam surfaces on the ring member. Then the said motion will be relative motion of the clamping elements.

Thus, a cable clamp according to this aspect of the present invention provides a relatively simple apparatus which is capable of providing an even clamping of the cable.

Preferably, the two clamping elements each include a bore for receiving a bolt, to provide the relative motion.

Ideally, the ring member will have a break and an opposed hinge thereby to be closeable over a cable to be clamped. Preferably, the break in the ring member is between the two cam surfaces thereof (when there are two such surfaces), and thus the ring member can be urged into the closed state by drawing together the two clamping elements, which drawing together will then provide the aforementioned relative motion.

Preferably, the cam surfaces of the ring member converge at an angle directed toward the abutment surface of the ring member, so that a drawing together of the clamping elements drives them toward the abutment surface

of the ring member. Other arrangements of the cam surfaces are, however, comprehended by the present invention so long as they provide a clamping action.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is an isometric view of the cable closure of the present invention, in the open state,

Figure 2 is a plan view of the cable closure of Figure 1,

Figures 3a-3i are sections on A-A, B-B etc of Figure 2;

Figure 4 is an isometric view of the cable closure of Figure 1 in the closed state,

Figure 5 is an enlarged partial view of the region shown in Figure 3a, showing the clamping means in the closed state; and

Figures 6 and 7 are side views of the clamping elements of the present invention.

The cable closure of the present invention, as shown in Figure 1, comprises a base portion 10 enclosing a connection area 12 and having a clamping region 14 at either end thereof. At either end of the base portion 10 and hinged thereto are sealing doors 16, adapted to close over the clamping regions 14. Between the two sealing doors 16 is a central door 18 hinged to the base portion 10 at the hinge line displaced from the common hinge line of the two sealing doors 16. Thus, the respective doors close

in opposite senses. The central door 18 is slightly wider than the length between the sealing doors 16. Thus, when all doors are closed, the central door 18 overlaps the two sealing doors 16. Thus, the inner extremities 20 of the sealing doors 16 and the outer extremities 22 of the central door 18 are shaped so as to mutually correspond, and include a trough 24 for receiving a sealing material (not shown) to give a satisfactory seal when all doors are closed.

Generally, a suspended telephone cable will be of the "Figure-8" design in which an upper tension cable which is generally steel-core shares a common insulation with a message-carrying cable suspended underneath by the insulation. Thus, the exterior of the cable has a Figure-8 aspect. Within the closure, it is not necessary to cut the tension cable; indeed this is undesirable as it would necessitate extremely firm clamping. Instead, it is the intention that the cable be laid through the aerial closure, with the tension cable running continuously and unaffected through the closure, but the message-carrying cable being exposed and, where necessary, spliced.

The half-apertures formed in the base portion 10 and spaced doors 16 are shaped so as to generally conform to the "Figure-8" shape of the cable. That is to say, there is a projecting vee 26 formed therein. At the top of the aperture 25, the base part 10 has a hook 28 extending over the aperture. This makes installation easier by allowing a user to "hang" the closure on a cable to be spliced

before sealing it to the cable and carrying out the necessary corrections.

Within the gripping portion 14, the base unit 10 and the sealing doors 16 each have a corresponding generally semi-circular recess 30. The vee projections 26 for conforming to the Figure-8 cable interrupt the semi-circularity of the recess. In use, the recess 30 is filled to level with an elastic gel of a type known to the skilled person. There is no lateral constraint provided for the gel, in use, although temporary lateral restraint may be added during curing of the gel if necessary. Thus, to seal a cable, the cable is placed on the surface of the gel and the lateral doors 16 closed over it. The gel will take up the exterior shape of the cable and provide a watertight seal.

With the lateral doors closed, the cable is clamped within the closure in the manner later described, and then appropriate connections can be made within the closure. A drop wire clamp 32 is provided within the interior of the closure for clamping drop wires prior to exit from the closure. This is of conventional construction. Drop wires than exit via apertures 34 or 36; it will be noted that aperture 36 comprises a double-walled internal space communicating with the semi-circular recess 30. This space can be filled with an open-cell foam, and the action of filling the semi-circular recesses 30 with gel will also cause that foam to be impregnated with sealant gel. Drop wires can then be passed through that to provide an

effective environmental seal.

Once installation is complete, the central door 18 is closed over the internal space 12. As previously discussed, this then overlaps the sealing doors 16 and seals against them. Longitudinal seals 38 are also provided to complete the seal of the closure. The central door 18 is held in the closed position by resilient lugs 40 which engage behind the rear face of the base portion 10. Additional security can be obtained by bolting the door closed through co-operating bushes 42a and 42b.

Although the previously described seals should prevent any ingress of moisture into the closure, it is possible if desired to provide a drain hole at the bottom of the base portion 10. This will enable any water which enters during installation to escape, but should not allow water to gain entry subsequently, since the major route of entry is along the surface of the cable.

Figures 2 and 3a-3i show detailed views of the aerial closure of the present invention, from which a precise view of the construction of the cable closure can be ascertained. Corresponding reference numerals are used throughout Figures 1-3.

Figure 4 shows the aerial closure of the present invention in the closed and sealed state (without a cable), from which it can be seen that the article as a whole is a self-contained unit. The reader may note that Figure 4 does not correspond precisely in all respects with Figures 1-3, but it depicts a close variant differing only in

respects immaterial to the invention.

The clamping means according to the second aspect of the present invention will now be described with reference to Figures 5, 6 and 7.

Figure 5 shows the clamping region 40 of the aerial closure 10, with the sealing door 16 closed on the base portion 10. Once closed, the clamping portion 10 is not intended to be re-opened (although this is possible), and it can therefore be considered as a continuous ring member 14. Within the ring member 14 are a pair of open slots 100 and 102. These slots are generally diagonal on the ring member 14, and converge toward a pair of abutment surfaces 104 designed to fit behind the message-carrying core of the cable to be clamped, at its junction with the tensioning core. One side of each slot 100 and 102 provides respective cam surfaces 106 and 108. These cam surfaces meet to form a vee arrangement, and at the apex of the vee a slot 110 extends a short distance back for reasons which will become apparent.

When assembled, the clamping elements 112 and 114 lie within the respective slots 100 and 102. The clamping elements 112 and 114 are shown, isolated, in Figures 6 and 7. They include cam surfaces 116 and 118 corresponding to the cam surfaces 106 and 108, and each have a chamfered bore 120 and 122 for receiving a bolt (not shown). The head of the bolt, and the nut, can abut against the chamferings 124 and 126. In use, the bolt passes through the bore 120, the slot 110, and the bore 122. Thus,

tightening of the bolt draws the gripping elements toward each other, and the action of the respective cam surfaces 108 together with 118 and 106 together with 116 pushes the clamping elements 112 and 114 toward the abutment surface 104 of the ring member 14. The gripping elements 112 and 114 are provided with abutment surfaces 128 and 130 facing toward the abutment surface 104 of the ring member, and hence the message-carrying core of the cable is clamped by tightening the bolt.

The arrangement of the cam surfaces 106 and 108 opposed to the hinge line of the spaced door 16 enables the door 16 to be clamped shut by clamping the cable. Thus, no separate cable clamping and cover securing steps need be made by the operator, and installation is thus made easier.

Although the present invention has been described with respect to a particular preferred embodiment, the skilled person will appreciate that many variations could be made on this embodiment without departing from the scope of the present invention. For example, it is within the ability of the skilled person to design a clamping ring using only a single clamping member.

CLAIMS

1. A closure apparatus for a cable connection, comprising a base portion and a plurality of doors, including a pair of transversely spaced sealing doors each incorporating a sealing member, thereby to enable sealing of a cable between the sealing door and the base portion, and a central door disposed between the sealing doors and adapted to seal the region between the sealing doors.

2. A closure apparatus according to claim 1 wherein the central door has a sealing member around its perimeter.

3. A closure apparatus according to claim 1 or claim 2 wherein the central door overlaps the sealing doors.

4. A closure apparatus according to any one of the preceding claims, wherein the sealing doors share the same hinge axis, which axis is spaced from the hinge axis of the central door, such that the sealing doors and the central door close in opposite senses.

5. A closure apparatus according to any preceding claim wherein the sealing of the cable is by means including an elastic gel.

6. A closure apparatus according to claim 5 wherein a block of gel is provided in each of the base portion and the sealing doors, in corresponding positions, such that closing the sealing door onto the cable causes the gel to conform to the outer shape of the cable and seal therewith.

7. A closure apparatus according to any one of the preceding claims including a cable clamp comprising a circumferential ring member including on its internal surface an abutment surface and at least one cam surface, and at least one clamping element having an abutment surface and a cam surface; the clamp being adapted such that when the cam surface of the clamping element is in contact with the cam surface of the ring member, motion of the clamping element causes the abutment surface of the clamping element to approach the abutment surface of the ring member.

8. A closure apparatus according to claim 7 having two such clamping elements, the ring member having two said cam surfaces, and the said motion being relative motion of the clamping elements.

9. A closure apparatus according to claim 8 wherein the two clamping elements each include a bore for receiving a bolt, thereby to provide the relative motion.

10. A closure apparatus according to claim 8 or claim 9 wherein the cam surfaces of the ring member converge at an angle directed toward the abutment surface of the ring member, so that drawing together of the clamping elements drives them toward the abutment surface of the ring member.

11. A closure apparatus according to any one of claims 7 to 10 wherein the ring member has a break and an opposed hinge thereby to be closeable over a cable to be clamped.

12. A closure apparatus according to claim 11 wherein the broken ring and opposed hinge comprise one of the said sealing doors and the base portion.

13. A closure apparatus according to claim 11 or claim 12 as dependent on claims 8, 9 or 10 wherein the break in the ring member is between the two cam surfaces thereof, thereby to enable the ring member to be urged into the closed state by drawing together the two clamping elements, which drawing together provides the said relative motion.

14. A cable clamp comprising a circumferential ring member including on its internal surface an abutment surface and at least one cam surface, and at least one clamping element having an abutment surface and a cam

surface; the clamp being adapted such that when the cam surface of the clamping element is in contact with the cam surface of the ring member, motion of the clamping element causes the abutment surface of the clamping element to approach the abutment surface of the ring member.

15. A cable clamp according to claim 14 having two such clamping elements, the ring member having two said cam surfaces, and the said motion being relative motion of the clamping elements.

16. A cable clamp according to claim 15 wherein the two clamping elements each include a bore for receiving a bolt, thereby to provide the relative motion.

17. A cable clamp according to claim 15 or claim 16 wherein the cam surfaces of the ring member converge at an angle directed toward the abutment surface of the ring member, so that drawing together of the clamping elements drives them toward the abutment surface of the ring member.

18. A cable clamp according to any one of claims 14 to 17 wherein the ring member has a break and an opposed hinge thereby to be closeable over a cable to be clamped.

19. A cable clamp according to claim 18 wherein the broken ring and opposed hinge comprise one of the said sealing doors and the base portion.

20. A cable clamp according to claim 18 or claim 19 as dependent on claims 15, 16 or 17 wherein the break in the ring member is between the two cam surfaces thereof, thereby to enable the ring member to be urged into the closed state by drawing together the two clamping elements, which drawing together provides the said relative motion.

21. A closure apparatus substantially as herein described with reference to the accompanying Figures.

22. A cable clamp substantially as herein described with reference to the accompanying Figures.

The Patent Office

Application No: GB 9526490.9
Claims searched: 1 to 13, 22

Examiner: F J Fee
Date of search: 15 February 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H2E [EFCK, EFCQ]

Int Cl (Ed.6): H02G

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	EP 0206854 A1	[E.M.E.F.]	
A	US 5266741	[BUTLER]	
A	US 4831215	[CLARK]	

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